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TITLE: Qualification of Primary Loop Manifold
of a Liquid Metal Thermoelectric Converter

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PURPOSE OF TEST: To check and verify the integrity of the welded joints.

DATE TEST COMPLETED: May 2, 1969

DRAWING NUMBERS: 981D986, 914E550, 981D984, 948C001

PART NUMBER: N/A

SERIAL NUMBER: N/A

NMDR: None

DISCREPANCIES: None

DOCUMENT REFERENCES: Test Specification - Thermoelectric Power MTS 001
April 22, 1969

MASTER

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WANL-TMI-1981

Qualification of Primary Loop Manifold of
a Liquid Metal Thermoelectric Converter

The mechanical cycling test was required to verify the integrity of the welded joints and the thin wall tube bends in the primary loop manifold assembly of a four pack thermoelectric module and to help establish structural and mechanical requirements of any possible redesign. The test section was subjected to more severe loading conditions than will be experienced during actual operating conditions.

The test was a mechanical simulation of the differential thermal expansion which occurs due to the approximately 600°F temperature differential in the subassembly. The actual load exerted on the test section represented this deflection. The effects on the joints and tube material were observed.

The test was conducted on a test segment of manifold designed to duplicate two of the flexible elbows; the transition joints between the elbows and the tubular module inner clad; and the welded joints of the elbows to the primary loop header. (Ref: Drawing 981D984.) The setup is shown in Figure 1.

The assembled test segment and hold-down bracket are shown on Drawings 981D986 and 914E550. The bracket was mounted to the base of the Universal Test Machine.

Dial indicators measured the relative displacement between the line of applied load (through the vertical axis of the primary loop header) and the attachment point at the hold-down bracket.

In the first test, the load was applied in fifty pound increments until the relative displacement of nine mils was measured between the loop header and the welded joint on the feedline elbow. The resulting load versus displacement curve is shown in Figure 1 and the test setup is shown in Figure 2.

The remaining tests were cycling the header assembly at increasing relative displacement. The summary of these tests are shown in Table I. Photographs of the test arrangement

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WANL-TMI-1981

are seen in Figures 3 and 4. Tabulated data from the dial indicators are available for review but will not be presented in this memorandum. The testing had no noticeable affect on the structural integrity of the weldment.

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Reactor Assembly and
Dynamic Experiments

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TABLE I
SUMMARY OF TESTS

Test	Type of Test	Loading	Loading Rate
1	Load-Deflection	50 lb. Increments to 9 Mils	Static
2	Cyclic	200 Cycles to 9 Mils	1 Cycle per min.
3	Cyclic	200 Cycles to 18 Mils	2 Cycles per min.
4	Cyclic	200 Cycles to 27 Mils	2 Cycles per min.
5	Cyclic	200 Cycles to 36 Mils	2 Cycles per min.

FIGURE 1

LOAD DISPLACEMENT CURVE FOR THE
LOOP MANIFOLD 121 WELDMENT

FIGURE 2

STATIC TEST SETUP OF
PRIMARY LOOP HEADER

FIGURE 3

CYCLING TEST SETUP OF
PRIMARY LOOP HEADER

FIGURE 4

CYCLING TEST SETUP OF
PRIMARY LOOP HEADER